DOCKET PILE COPY GRIGINAL

RECEIVED

Before the FEDERAL COMMUNICATIONS COMMISSION Washington, D.C. 20554

DEC:1 7 1993

FEDERAL COMMUNICATIONS COMMISSION OFFICE OF THE SECRETARY

In the Matter of:)	
Simplification of the Depreciation Prescription Process)))	CC Docket No. 92-296

COMMENTS OF THE UNITED STATES TELEPHONE ASSOCIATION

Martin T. McCue Vice President & General Counsel 1401 H Street, NW Suite 600 Washington, DC 20005 (202) 326-7247

December 17, 1993

No. of Copies rec'd

TABLE OF CONTENTS

SUMI	MARY OF COMMENTS	İ
I.	THE COMMISSION SHOULD DEVELOP RANGES IN A FORWARD-LOOKING MANNER, AS ANTICIPATED BY DEPRECIATION THEORY	2
II.	THE COMMISSION SHOULD ADDRESS THE ACCOUNTS COVERED BY THE ORDER IN A MANNER DIFFERENT THAN IS PROPOSED THERE	6
III.	THE COMMISSION SHOULD INCLUDE ADDITIONAL ACCOUNTS WITHIN THE SCOPE OF THE ORDER AND SET RANGES THAT CAN BE USED BY CARRIERS IN 1994	9
IV.	CONCLUSION	12
ATTA	CHMENTS	

SUMMARY OF COMMENTS

There is one overriding policy concern for USTA members in the Order's proposed ranges. The Order evidences bias in the lower end of the range for each account's projected lives, a bias against rates that are forward-looking. Recent retirement patterns are not an indicator of the impact of massive industry changes now underway. Accounting for investments and retirements alone does not incorporate the diminished economic values that are being experienced now, and that are likely to be more prevalent and of greater magnitude in the future. It is inconceivable that exchange carriers will not face the same level of competition as other carriers in the very near future.

The rates proposed in the Order do not reflect today's marketplace and depreciation realities. The lower ends of the ranges to be prescribed will not reflect the actual depreciation experience of today's assets. A future-oriented technology forecasting approach is the best - and perhaps only - way to insure economic recovery and proper depreciation levels.

USTA is submitting a study, <u>Telecommunications Equipment Depreciation</u> - <u>Looking to the Future</u>, prepared for USTA by Technology Futures, Inc. (TFI), a consultant that is nationally recognized in this area. The TFI Study uses a future-oriented technology forecasting approach.

With respect to specific accounts, USTA focuses on: Analog Circuit Equipment; Underground Cable; other Non-Metallic Cable accounts; and General Purpose Computers.

USTA recommends that the Commission propose ranges for all accounts at this time. A sequence of steps such as that anticipated here would be feasible for all other accounts. USTA requests that the Commission promptly issue a second Order Inviting Comments for all accounts not covered by the November 12 Order.

FEDERAL COMMUNICATIONS COMMISSION Washington, D.C. 20554			
In the Matter of:)		
Simplification of the Depreciation Prescription Process) CC Docket No. 92-296	,	

COMMENTS OF THE UNITED STATES TELEPHONE ASSOCIATION

The United States Telephone Association (USTA) respectfully submits these comments on the Commission's Order Inviting Comments (Order) in this proceeding, released November 12, 1993. The Order is the first step in the implementation of the Commission's Report and Order in this proceeding, released October 20, 1993.

The Order identifies twenty-two accounts for which the Commission seeks to establish ranges under the Report and Order. Order at ¶ 3. These ranges will be available for use beginning in 1994. Id. The Commission proposes certain limits on use of the ranges by affected carriers, with some limitations relating to the use of the ranges in rate categories (rather than at the plant account level) for four accounts. Order at ¶ 5-6. The Commission has indicated that any carrier that has or will subdivide their accounts into rate categories for four identified accounts will be able to use this approach. Order at ¶ 6. USTA accepts this approach as reasonable for the present. These comments are responsive to the main issues identified in the Order, and seek

¹ A summary of the <u>Report and Order</u> appeared at 58 Fed. Reg. 58788 on November 24, 1993. USTA and a number of other parties filed petitions for reconsideration of the <u>Report and Order</u> by the due date of December 6, 1993. Those petitions are pending.

action that will help deliver to the American consumer an advanced digital, broadband communications network as quickly as progressive regulation will allow.

THE COMMISSION SHOULD DEVELOP RANGES IN A FORWARD-LOOKING MANNER, AS ANTICIPATED BY DEPRECIATION THEORY.

There is one overriding policy concern for USTA members in the Order's proposed ranges. The Order evidences unnecessary bias in the lower end of the range for each account's projected lives, a bias against rates that are forward-looking. Ranges proposed in the Order are based on an average of current factors only, without further assessment or evaluation. Composite rates prescribed for subject exchange carriers in 1992 averaged about 7.0% - a figure that is substantially lower than rates used by companies elsewhere in the economy that use similar assets. Unregulated interexchange carriers and access carriers such as MCI (8.4% composite rate in 1992) and MFS (8.2% composite rate in 1992), and dominant carriers like AT&T (10.0% composite rate in 1992) all booked depreciation costs substantially above those allowed for the subject exchange carriers.² These differences create a bias against exchange carriers, a bias that is longstanding, but not merited.³

² <u>See also</u> Attachment 1, a chart that describes the asset lives for key accounts used by US West for financial reporting purposes. These numbers are not restrained by the influence of regulators, and are more in line with experience.

³ Prior to divestiture, subject exchange carriers could expect a composite of approximately 6%. Over the past decade, the composite has moved upward at an extremely slow pace - roughly 0.1% per year. Although AT&T had a predivestiture composite rate roughly equal to that of the exchange carriers, its rates are now substantially in excess of the subject carriers, notwithstanding the similarity of assets and basic service characteristics.

Such bias is not consistent with the nature of depreciation, nor is it consistent with the Report and Order. Depreciation is by its nature forward-looking, and it is intended to anticipate what will happen in the future with assets. The Order's range proposal does not look forward, but relies on data that is already old. Recent retirement patterns are not an indicator of the impact of massive industry changes now underway, and there are few who don't acknowledge this outside the Commission.

USTA is concerned about the continuing reliance on a service value basis for establishment of depreciation rates. It is no longer valid for regulators to focus their sights on the actual rate of plant retirement as a surrogate for service value when there is rapid technological change and the increased pressure of competition. This continuing linkage of historic rates of plant retirement to depreciation rates continues an outdated rate base-net asset value tie that flies in the face of incentive based regulation. The existence of "sharing" alone does not justify continuation of the older approach. The Commission's views, reflected at ¶ 56 of the Order, cannot form the basis for the establishment of depreciation rates for carrier assets going forward.

Accounting for investments and retirements alone does not incorporate the diminished economic values that are being experienced now, and that are likely to be more prevalent and of greater magnitude in the future. It is inconceivable that exchange carriers will not face the same level of competition as other carriers in the very near future. A good part of the competition that is emerging is coming from cable television and new fiber network providers, who are using depreciation lives that are much shorter than those prescribed for the subject exchange carriers. An average of those companies'

depreciation lives should be considered as a source for setting factors for carrier accounts. Waiting until the retirement patterns themselves evidence these major changes will only insure that the recovery of investment in the carriers' assets will not occur.

The radical changes in technology and the marketplace will put increasing demands on subject carriers to seek shorter depreciation lives for their regulated property.⁴ USTA fears that past regulatory incentives to set longer lives in order to keep telephone rates low will have longer term effects on the depreciation simplification process as a result of the Order's proposals. The rates proposed in the Order do not reflect today's marketplace and depreciation realities. The lower ends of the ranges to be prescribed will not reflect the actual depreciation experience of today's assets. A future-oriented technology forecasting approach is the best - and perhaps only - way to insure economic recovery and proper depreciation levels.

Most of the lives that could be prescribed by the Commission within the basic factors set out in the attachment to the Order, and that could be utilized by carriers, are higher than the lives that were prescribed by the Commission for AT&T alone in 1991, almost three years ago. This disparity is not merited. USTA is submitting as Attachment 2 to these comments a study, <u>Telecommunications Equipment Depreciation</u> - <u>Looking to the Future</u>, (Study) prepared for USTA by Technology Futures, Inc. (TFI), a consultant that

⁴ In the technologically sensitive outside plant cable accounts that comprise most of its investment subject to prescription, AT&T has depreciation lives that are 20-50% better than the best possible projected lives for the subject exchange carriers: 12.5 to 20 years for AT&T, versus 25 to 30 years for the subject exchange carriers.

is nationally recognized in this area. The TFI Study uses a future-oriented technology forecasting approach. It makes the following core points:

Massive change is occurring in the telecommunications industry, including change in the mass market for voice services. This is due to technologies such as SONET, ATM switching, optical fiber in the loop, and advanced digital loop carrier. Technologies based on internationally accepted standards will displace older and less flexible alternatives.

That change is inevitable.

Depreciation policy must accommodate that change.

Depreciation policy can reconcile the public interest in an advanced "information highway" with that change, and failure to reach that reconciliation will discourage progressive network development.

The weaknesses of historical mortality analysis make it inadequate as a method to forecast depreciation when technological obsolescence is the major driver for retirements.

Use of proven, reliable methods to forecast future technology change - such as technology substitution analysis, and in particular, the Fisher-Pry model - are available and will help regulators forecast depreciation lives for carrier assets. Use of these analytic methods provides very accurate forecasts of equipment lives.

From such analysis, survivor curves can be developed, and used to estimate the average remaining life of equipment remaining in place. This can be a determinant of projection life in times of technological change.

Certain observations and recommendations are made with respect to specific accounts or groups of accounts by TFI.

The Commission should rely on the TFI Study in setting the factor ranges it will prescribe for carriers' accounts. The Commission should enter the post-Report and Order period with an approach that will be forward looking in setting ranges. The current proposals incorporate historical factors that can no longer anticipate industry change and set future depreciation lives with enough accuracy. The proposals in the Order are too

passive in nature, and do not confront today's capital recovery realities with sufficient vigor.

II. THE COMMISSION SHOULD ADDRESS THE ACCOUNTS COVERED BY THE ORDER IN A MANNER DIFFERENT THAN IS PROPOSED THERE.

USTA focuses on the following groups of accounts in this section: Analog Circuit Equipment; Underground Cable; other Non-Metallic Cable accounts; and General Purpose Computers. This is not to say that the ranges proposed for the other accounts reflect current conditions. They do not. However, in order to expedite the implementation of the Commission's policy in favor of greater depreciation simplification, USTA's comments focus on the more significant accounts. The TFI Study addresses some specific areas addressed in the Order, and the Commission is referred to the discussion there, as well as to the comments of individual USTA members.

ANALOG CIRCUIT EQUIPMENT: The TFI Study addresses Analog Circuit

Equipment by discussing the rapidly increasing rate of displacement of such equipment.

The Commission's proposed ranges are inadequate to deal with this and other events.

As TFI states, analog equipment has no place in a future-oriented digital network.

The lower end of the range proposed by the Commission is not low enough to reflect the actual depreciation lives that will be experienced by the subject carriers. For example, the projected life permitted to AT&T for this account in 1991 was 5.2 years, a full 2.8 years below the lowest allowable life to be allowed for the exchange carriers.

Analog accounts are in atrophy due to technological change. The Commission should recognize Analog Circuit Equipment as a "dying account", using amortization

procedures similar to those it has applied to other such accounts. Carriers have utilized this arrangement constructively.

UNDERGROUND CABLE: The TFI Study also shows that the proposed low end of the range for projected lives is much too high for the relevant assets. The exchange carriers are very concerned that the proper ranges be established for copper cable accounts, because of the massive investment that was made in this increasingly disfavored technology before the emergence of optical fiber.

In actual operation, the ranges proposed by the Commission will limit beneficial investment changes - indeed, changes that are being required by law. For example, the recently enacted Agriculture Appropriations Act, HR 2493, signed on October 21, requires that states develop telecommunications modernization plans by statute or regulatory order within one year. One of the components of such a plan must be a provision to make broadband video and data available at T-1 equivalent rates to subscribers in rural areas. Dealing with this Federal legislative mandate, using the proposed ranges set out in the Order, is not possible, because carriers will be denied the ability to promote capital recovery and prudent investment decisions. The 30 year projected life at the high end of the range anticipates final retirement sometime around the year 2040 - nearly a half century away. Delaying recovery of this investment until that time creates a strong disincentive for technology deployment sooner. See

patterns of underground copper. Shorter lives are anticipated by this and related legislation and regulatory action.⁵

The arguments set out above and in more detail in the TFI Study are applicable to all copper accounts, including accounts not covered in the Order. The projection lives suggested by the TFI Study should be adopted as the lower end of the range. As shown in the filings of the subject carriers, they too have supported more progressive numbers in their last represcription filings. In addition, the carriers have provided data to state regulators and others that support more progressive numbers.

OPTICAL FIBER (NON-METALLIC) ACCOUNTS: The ranges for projected lives proposed for these accounts also are too high, as shown in the TFI Study. Again, the Commission should use the average projection life suggested in the TFI Study - 15 years as the lower range factor. In the optical fiber accounts in particular, it is critical to the continuing viability of this country's backbone networks that future deficiencies not be permitted to creep into depreciation rates as they did with copper accounts in the past. This area is too important not to deal with it correctly <u>ab initio</u>. Lives for the copper cable accounts were in these same ranges in the past, when there was little or no

⁵ Similar regulatory expectations are being set in place widely on the state level. In New Jersey, for example, the state regulatory commission has put in place an alternative regulatory framework that also anticipates deployment of full broadband capability by the year 2010. That commission is not using aspects of the alternative regulation framework to limit depreciation reform, but to promote it affirmatively and constructively. See Decision and Order, In the Matter of New Jersey Bell Telephone Company for Approval of its Plan for an Alternative Form of Regulation, Docket No. T092030358, agenda dates December 22, 1992 and April 14, 1993.

competition and technology was not changing so quickly. Current realities demand realistic depreciation lives that promote responsiveness in the marketplace.

USTA supports a lower projected life range for these accounts of 15 years. In no event should any optical fiber account have a life of more than 20 years. Comparable AT&T investment has been prescribed at 20 years since 1991. If anything, the life is being reduced.

COMPUTERS: Arthur Anderson published the results of a survey in 1987 that addressed the depreciation policies of non-regulated companies with respect to support assets.⁶ Computer equipment including personal computers, software and other data processing equipment was separately identified and included in the survey. The survey concluded that the average depreciable life of computer equipment was 4.81 years, with a range of 2 to 10 years. USTA believes the Commission should use these results in setting the factors for computers.

III. THE COMMISSION SHOULD INCLUDE ADDITIONAL ACCOUNTS WITHIN THE SCOPE OF THE ORDER AND SET RANGES THAT CAN BE USED BY CARRIERS IN 1994.

USTA recommends that the Commission propose ranges for all accounts at this time. The Commission was able to adopt and release an Order proposing the ranges for twenty-two accounts very quickly. It should not be difficult for the Commission to update those ranges and to adopt final ranges for those accounts that are more in line with current and future market demands, as described in these Comments and

⁶ Illinois Bell Telephone Company Capital Recovery Survey, Arthur Anderson and Company, March, 1987.

documented by the TFI Study. That sequence of steps should not be difficult to pursue for all other accounts.

A base of information exists today to determine life ranges. The TFI Study that is attached analyzed data over a ten year period to come up with its recommendations. These data are derived from the ARMIS reports of carriers that have been filed with the Commission and are easily available for reference. USTA supports those ranges, and requests that the Commission promptly issue a second Order Inviting Comments for all accounts not covered by the November 12 Order.

For example, the following accounts are appropriate for range consideration now.

ANALOG ESS, CROSSBAR, AND STEP-BY-STEP SWITCHING: USTA believes that the Commission recognizes that these central office technologies, while functional, cannot deliver the full range of services that will be routinely delivered elsewhere in the future telecommunications environment. There has been a procedure (AYFR, or average year of final retirement) within which carriers have been able to establish procedures to accommodate forecasted retirements. This procedure can continue to be employed. It is more consistent with the goal of deploying advanced central office technologies.

ALL OTHER METALLIC (COPPER) ACCOUNTS: As described above, the arguments set out in the TFI Study are applicable to all copper accounts, including accounts not covered in the Order. The lives suggested by the TFI Study should be adopted for all such accounts. The factors that come in to play are similar, if not identical.

DIGITAL SWITCHING: The TFI Study proposes a lower range for projected life of 10 years. TFI points out the modular architecture of these switches and the emergence of ATM technology. USTA supports that proposal, on the basis of the analysis contained therein.

DIGITAL CIRCUIT EQUIPMENT: As TFI states in its Study, virtually all circuit equipment will be affected, if not displaced, by SONET technology. USTA supports a projected life of 9 years, as suggested by the TFI Study.

POLES: Telephone poles still constitute a significant undepreciated asset. Pole deployment is generally static, in that there has tended to be either little change or a net reduction in poles for most carriers in the past few years. The comparisons that can be made with direct burial of underground metallic cable or fiber make direct burial increasingly more common.⁷

Of course, there is great variation in the industry in the life of poles. The mean appears to be 28.1 years. Salvage is more of a concern with this account than with others, and negative salvage will operate to disserve those interests. Recent industry experience has averaged -60%, with some carriers exceeding -130%. Taking into account increased environmental oversight over some chemicals that have been used for

⁷ See Comments of USTA that have been filed in pleading cycles over the past few years in Telephone Company-Cable Television Cross Ownership Rules, Sections 63.54-63.58, Notice of Inquiry, 2 FCC Rcd 5092 (1987); Further Notice of Inquiry and Notice of Proposed Rulemaking, 3 FCC Rcd 5849 (1988); Further Notice of Proposed Rulemaking, First Report and Order and Second Further Notice of Inquiry, 7 FCC Rcd 300 (1991); Memorandum Opinion and Order on Reconsideration, 7 FCC Rcd 5069 (1992); Second Report and Order, Recommendation to Congress and Second Further Notice of Proposed Rulemaking, 7 FCC Rcd 5781 (1992).

pole preservative purposes, the cost of removal and disposition can only be expected to

increase, and some carriers may look to other alternatives sooner than might otherwise

be the case.

A projected life of 20 years is appropriate, and the proposed numbers for salvage

should be adjusted to -120 to -60%. Adoption of these figures will serve the public

interest, and will help carriers look to other support structures for service delivery where

appropriate. The transition to less reliance on poles will serve a number of public

policies, relating to capital recovery, technological advance, and more general

environmental and aesthetic interests.

OTHER ACCOUNTS: USTA supports flexibility for price cap carriers to use their

last prescribed factors for these accounts, with minimal additional paperwork burdens.

IV. CONCLUSION.

The Commission should take action consistent with these comments, and should

actively pursue the establishment of ranges for all accounts that will serve the public

interest by reflecting prospective expectations of asset depletion and obsolescence.

Respectfully submitted,

UNITED STATES TELEPHONE ASSOCIATION

Martin T. McCue

Vice President and General Counsel

1401 H Street, N.W. - Suite 600

Washington, D.C. 20005-2136

(202) 326-7247

December 17, 1993

12

ATTACHMENT 1

US WEST COMMUNICATIONS ASSET LIVES FOR KEY ACCOUNTS

These asset lives are used for Securities and Exchange Commission (SEC) financial reporting purposes:

	Projected Life
Digital Switch	10
Circuit Digital	10
Circuit Analog	7
Metallic Cable:	
Aerial	15
Underground	15
Buried	20
All Fiber	20

Attachment 2

Telecommunications Equipment Depreciation— Looking to the Future

Lawrence K. Vanston, Ph.D. Technology Futures, Inc. 11709 Boulder Lane Austin, TX 78726

December 15, 1993

Introduction

Most people's vision of America's future includes a dynamic role for telecommunications in providing the information highways to serve the information age. The metaphor "information highways" is appropriate because modern telecommunications is as essential to our competitiveness and well-being in the future as the development of modern highways were in the past. Naturally, government policy-makers have an interest in paving the way for the information highway, not in the literal sense as with transportation highways, but by developing policies that are forward-looking and encourage innovation and investment.

There are many facets to telecommunications policy and each are important to forward progress. In this paper, I address one facet—equipment depreciation—as it relates to the future. My premise is that depreciation policy should be consistent with both our goals for the future and the inevitable, massive changes happening in the telecommunications industry. For the most part, current regulatory depreciation methodology and practices are blind to the future and may well discourage development of the

information highway. At the very least, they are damaging to a group of companies with a critical role to play in building the infrastructure we need.

Fortunately, as I will discuss, there are reliable methods that allow us to forecast future technology changes, and thus depreciation lives. Developed and tested over many years, within and without the telecommunications industry, these methods have proven very reliable for forecasting. Their basis lies in an understanding of the process of technology change and the use of available data to produce quantitative forecasts. These methods from the field of technology forecasting are not proprietary and are widely used in industry. As with most good tools, their proper application requires effort, knowledge, and judgment. Nevertheless, they are easily-learned, logical, and understandable.

Established in 1978, Technology Futures, Inc. (TFI) has been applying technology forecasting to the telecommunications industry since 1984. Much of our telecommunications work has been supported by the Telecommunications Technology Forecasting Group (TTFG), an industry association of major local exchange carriers (LECs) in the United States and Canada which was formed in 1985. The mission of the TTFG is to support the understanding and use of technology forecasting to predict and support the continued evolution of the telecommunications network. Under TTFG sponsorship, TFI has produced 14 major studies on telecommunications technology adoption in a span of eight years, long enough to establish a track record. The list is shown in Exhibit 1. In addition, we have just completed new forecasts of major categories of equipment.

A unifying conclusion from these studies is that regulatory depreciation lives are much too long, especially given the climate of rapid change we are entering. In particular, the range of lives proposed by the FCC in this proceeding are not even close to including the appropriate lives for telecommunications equipment. Proposed herein are more realistic equipment lives that any reasonable range should include.

Drivers for Change

A good forecaster must recognize the important drivers for change in the industry. In telecommunications, the major drivers are technological advance, new services, and competition. Each taken alone would be enough to cause rapid change; together, they reinforce each other with unprecedented impacts.

The Technology Driver

On the technology front, there are many developments impacting the industry. Four of the key technologies are:

- The Synchronous Optical Network (SONET) transmission on fiber optic systems
- Asynchrounous Transfer Mode (ATM) switching
- Next Generation Digital Loop Carrier (NGDLC)
- Fiber in the Loop (FITL)

As usual with new technologies that are adopted by the telephone industry, the benefits of these technologies are reduced operating costs, reduced capital costs, better service, or, in some cases, new services. Reduction in costs has long been a primary driver for modernization in telephony and other industries. Although the pace of technology change has increased, the recognition of this driver is well accepted both in industry and among regulators.

The Services Driver

Although technology has long been used to provide more economical service, we need to also recognize the importance of providing, universally and economically, the new digital services that are absolutely required if we are to be competitive in the information age. These new services provide end-to-end digital connectivity at various data rates. Roughly speaking, we divide these services into categories according to the data rate: narrowband (64 Kb/s), wideband (1.5 Mb/s), and broadband (45 Mb/s and above).

The services that will have the widest impact are those that are public switched services based on international standards. The narrowband Integrated Services Digital Network (ISDN) is the first of these services to see widespread availability. Later, Broadband ISDN, based on fiber optics, SONET transmission, and ATM switching, will become publicly available. In the meantime, there are a number of other services with varying degrees of bandwidth, functionality, standardization, cost, and availability.

¹ The data rates in parenthesis are representative of each category; the boundaries between the categories are somewhat fuzzy. Also, some people use the term broadband to refer to wideband as well.

The applications for these services include advanced fax, computer-based imaging, LAN interconnection, video communications, interactive multimedia, and interactive television. Today, the market for digital communications services for these applications is relatively small; however, the potential for growth is tremendous, especially when these services are extended beyond large business customers.

The Competitive Driver

Competition has entered the local exchange business, and it will increase dramatically throughout the 1990s. So far, most local exchange competition has centered on the large business customer. Competitive access providers are already serving large businesses in concentrated areas, and cable television companies are providing alternative access for high-bandwidth services.

The next competitive arena will be the mass market for voice services. In addition to providing interactive television services, cable TV companies will also compete in voice services. While the possibility of offering voice service over cable television facilities has existed for years, ongoing technological improvements and the increasingly competitive atmosphere now make it a virtual certainty. With cable companies, such as Time-Warner and TCI, teaming with experienced telecom players, such as U S WEST and Bell Atlantic, we can expect this competition to develop very rapidly.

In addition to cable companies, cellular radio, and later, personal communications networks, are competing in the voice services market. As wireless prices come down and numbers of subscribers increase, we expect a

significant impact on wireline revenues, initially on usage-sensitive revenues and access charges, and later, on non-usage-sensitive revenues. AT&T's acquisition of McCaw Cellular and its announced plans to acquire properties (or enter into strategic relationships) in non-McCaw territories is but one indication of the seriousness of this competitive threat. Of course, one motivation for interexchange carriers to bypass the telco's local loop is to avoid access charges.

Apart from its intrinsic impact on revenues, competition also changes the nature of the other drivers. In a monopoly, one player determines the rate of modernization; under competition, the fastest, most aggressive player sets the pace. This makes for a faster track. Having obsolete technology can be fatal if a competitor has lower operating costs and is paying significantly less for the new technology.

Likewise, competition impacts the new services driver. In a monopoly, the pace of pursuing new markets is left to the monopolist; in a competitive market, the most aggressive competitor can quickly dominate market share. In a monopolistic setting, the customer must work around any bottleneck; under competition, salespeople are eager to inform the customer of existing alternatives. Again, this makes for a faster track. Investment in the technology to provide a new service may be required earlier, and, consequently, at greater risk than a monopolist or regulator would normally find comfortable.

Weaknesses in the Regulatory Depreciation Methods

The traditional regulatory depreciation methods typically start with historical mortality analysis, and then apply judgments about how the future may be different than the past. These methods look at past retirement history in an equipment category to provide guidance about future retirements. Although it has a long history and is mathematically sophisticated, mortality analysis is insufficient to estimate depreciation lives when technological obsolescence is the major driver for retirements. Analyzing recent retirement data simply does not capture the dynamics of the adoption of new technology and the obsolescence of old technology.

For example, Exhibit 2 plots vintage survivor curves for crossbar switching for a major LEC. Note the "avalanche effect" between 1975 and 1980. During this period, all vintages experienced sudden and simultaneous retirements as electronic switching was rapidly adopted. Given the low retirement rates prior to 1975, standard mortality analysis of retirements would not account for it until after the fact.

The avalanche curves also show that, when technological obsolescence is the major driver for retirements, there is no such thing as a constant service life. Equipment purchased late in a technology generation will have a much shorter life than equipment purchased earlier. Further, the projection life for new equipment is roughly the same as the average remaining life of existing equipment because technology will force most of the equipment out in the same period of time. Finally, large amounts of investment are made in the old technology well after the new technology is introduced and up to the time the avalanche starts. These observations are contrary to most people's

concept of depreciation, especially mortality-based depreciation, but they reflect reality.

Technological Substitution Analysis

Substitution analysis provides an independent way to forecast the shape of a product's life cycle curve. It is a technology forecasting technique that has proven to be effective in projecting the adoption of new technology and the obsolescence of old technology. Substitution refers to the displacement of an established technology by a newer technology because the new technology provides substantially improved capabilities, performance, or economies. With substitution, technological superiority of the new technology—not wear-out—is the driver for replacement.

Substitution analysis examines the pattern of technology substitution. This pattern is remarkably consistent from one substitution to another. At first, a new technology is adopted slowly because, in spite of its advantages, when it is first introduced, it can be expensive, unfamiliar, or imperfect. The old technology, on the other hand, may be less expensive due to economies of scale. Also, it is well known and is already broken in. As the new technology improves, it finds more and more applications, achieves economies of scale and other economic efficiencies, and becomes generally recognized as superior. The old technology, because of its inherent limitations and falling market share, cannot keep up. The result is a period of rapid adoption of the new technology, beginning at about the 15% penetration level. This corresponds with a period of rapid abandonment of the old technology.

Toward the end of the substitution, the adoption of the new technology slows